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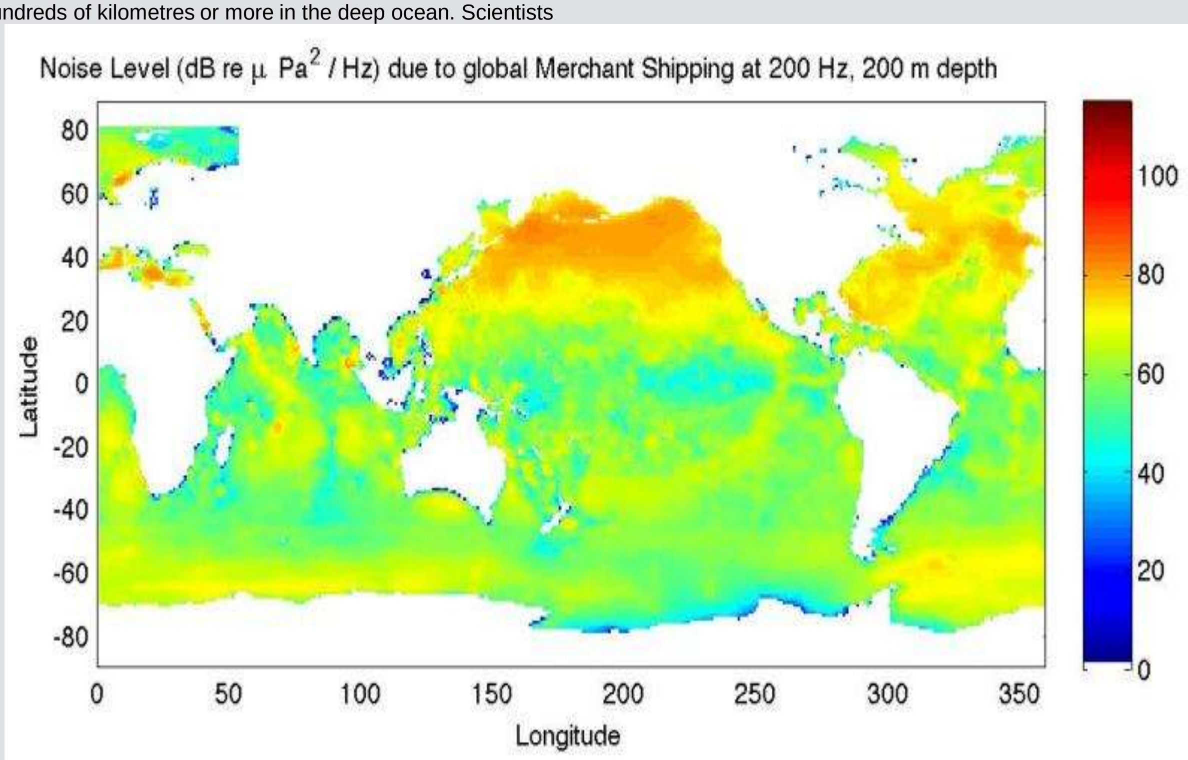
KPI Information Update IU-37-2013 (Shipping Noise Spanning the Globe)

The ocean is naturally filled with the sounds of breaking waves, cracking ice, driving rain, and marine animal calls, but more and more, human activity is adding to the noise.
Ships' propellers create low-frequency hums that can travel hundreds of kilometres or more in the deep ocean. Scientists have now modelled this shipping noise on a global scale. The world-wide maps will be presented for the first time at the 21st International Congress on Acoustics (ICA 2013), held June 2-7 in Montreal.



Modelled noise spectrum level at 200 Hz and 200 m depth, due to merchant shipping for the year 2006 (Credit: Michael Porter, Heat, Light, and Sound Research, Inc.)

"The most important thing about these maps is that seeing the sound can get people thinking about its effects," says Michael Porter, President and C.E.O. of Heat, Light, and Sound Research, Inc., a company that has been working with the U.S. Office of Naval Research and the National Oceanic and Atmospheric Administration to create models of the global ocean soundscape.
The maps show shipping noise spreading across the ocean in a diffuse haze. The highest levels of noise appear in the northern parts of the Atlantic and Pacific Oceans and along popular shipping passages like the Suez Canal. There are also interesting areas of relative quiet, for example across the middle of the Atlantic Ocean. Porter notes this might be caused by the Mid-Atlantic Ridge, an underwater mountain range at the boundary of the Eurasian and North American tectonic plates, which could be stopping the long-range transmission of sound.
Many complicated components went into the creation of the soundscape maps, Porter says. Water temperature, pressure, and salinity all affect how quickly sound travels through the ocean. Fine grained ocean floor sediment easily transmits sound waves while smooth volcanic rock can send them scattering back. Porter and his colleagues fed data about water depth and ocean floor characteristics, as well as the location and number of merchant ships, into a computer model that calculated the propagation path of the sound waves created by the ships.
Porter compares the process of modelling sound propagation in the ocean to the challenge of modelling how light fills a room. "The way the seafloor can absorb or reflect sound is similar to the way a carpet might absorb or reflect light depending on whether it is dark or light," he says.
Going forward, Porter and his colleagues plan to refine their model results with updated environmental and noise source data. Modelling ocean sounds on a global scale could be a key step toward understanding how human activities affect

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marine ecosystems, which in turn could help policy makers decide whether or how to regulate industrial activities in the ocean. Although much more research is needed, Porter says it is important that the conversation has been started.

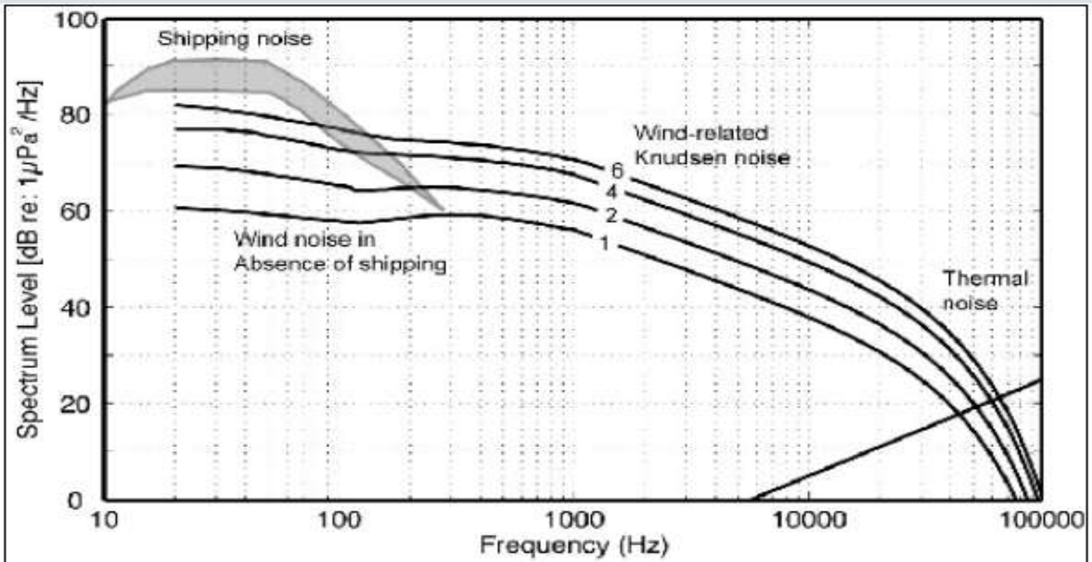

Figure 1. Ocean ambient noise for frequencies between 10 Hz and 100 kHz. This plot has the same form as the underwater noise curves developed by the U S Navy in the 1960's (Wenz 1962), but it has been modified to reflect modern levels of shipping noise (shaded area), which exceed natural wind-noise, even for high sea-states (numbered curves). Figure courtesy of J. Hildebrand, Scripps Institution of Oceanography/UCSD.

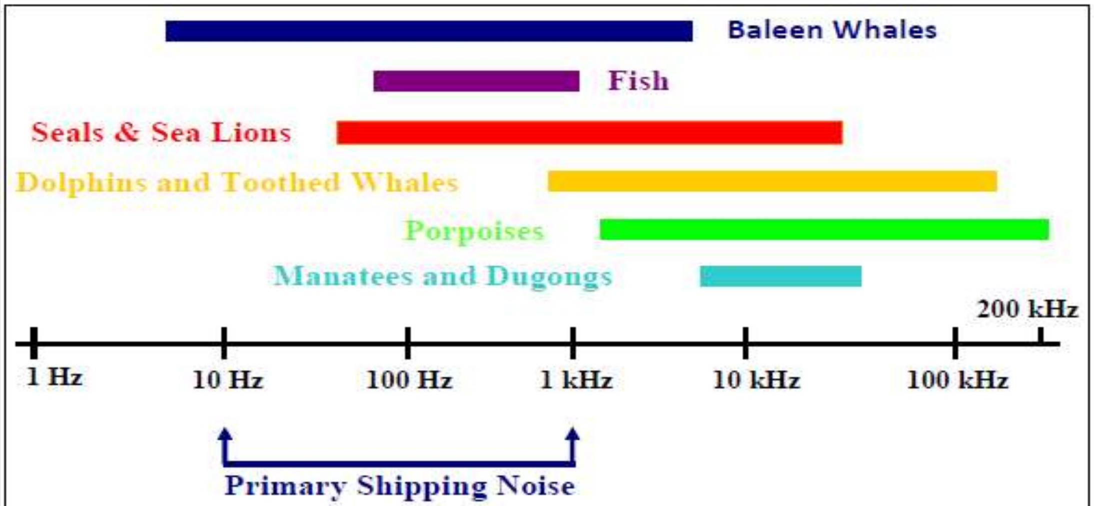

Figure 2. Frequency Relationships Between Marine Animal Sounds and Sounds from Shipping. Figure courtesy of B. Southall, NMFS/NOAA